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## C-A OPERATIONS PROCEDURES MANUAL

### 7.1.24 COLD EXPANDER PURGE PROCEDURE

Text Pages 2 through 8

#### Hand Processed Changes

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Approved: *Signature on File* \_\_\_\_\_  
 Collider-Accelerator Department Chairman Date

A. Warkentein

## **7.1.24 Cold Expander Purge Procedure**

### **1. Purpose**

This procedure provides the instructions for purging the cold expander trains with the brake assembly installed to remove air contaminants from system. The procedure contains the following sections:

- 5.1 Purge of turbine 5A only.
- 5.2 Purge of turbine 6A only.
- 5.3 Purge of turbines 5A , 6A and heat exchanger HX7A.
- 5.4 Purge of turbine 5B only.
- 5.5 Purge of turbine 6B only.
- 5.6 Purge of turbines 5B, 6B and heat exchanger HX7B.

### **2. Responsibilities**

- 2.1 The shift supervisor or an operator designated by the shift supervisor is responsible for conducting the procedure and providing documentation in the cryogenic control room log.
- 2.2 Should a problem arise in the process of purging an expander, the shift supervisor shall report to the technical supervisor for instructions before continuing.

### **3. Prerequisites**

- 3.1 The expander must be offline while purging.
- 3.2 The oil system must not be operation during purging.
- 3.3 The pure helium supply line must be pressurized.

### **4. Precautions**

If the refrigerator is operating, all personnel entering the refrigerator wing of Bldg.1005R must have a Personal Oxygen Monitor (POM) and carry an emergency escape pack.

### **5. Procedure**

#### **5.1 Expander 5A Only**

- \_\_\_\_\_ 5.1.1 Install brake assembly per C-A OPM 7.1.26.
- \_\_\_\_\_ 5.1.2 Ensure regulator PR9182M is installed.

- \_\_\_\_\_ 5.1.3 Close and block valve H385A.
- \_\_\_\_\_ 5.1.4 Ensure closed valves H397M\_\_\_\_\_ H393M\_\_\_\_\_ and H430M\_\_\_\_\_.
- \_\_\_\_\_ 5.1.5 Back off regulator PR9182M.
- \_\_\_\_\_ 5.1.6 Open expander vane valve H390A.
- \_\_\_\_\_ 5.1.7 Open valves H431M\_\_\_\_\_ and H395M\_\_\_\_\_.
- \_\_\_\_\_ 5.1.8 Crack open valve H695M. This valve will be throttled during the purge operation for adequate flow.
- \_\_\_\_\_ 5.1.9 Open valves H9182M\_\_\_\_\_ and H393M\_\_\_\_\_.
- \_\_\_\_\_ 5.1.10 Adjust regulator PR9182M to 40-psi as read on outlet pressure gauge PI9215H.
- \_\_\_\_\_ 5.1.11 Purge expander for a minimum of 15 minutes.
- \_\_\_\_\_ 5.1.12 Close valves H695M\_\_\_\_\_ H395M\_\_\_\_\_ and H393M\_\_\_\_\_.
- \_\_\_\_\_ 5.1.13 Close valves H9182M\_\_\_\_\_ H431M\_\_\_\_\_.
- \_\_\_\_\_ 5.1.14 Close vane valve H390A.

## 5.2 Expander 6A Only

- \_\_\_\_\_ 5.2.1 Install brake assembly per C-A OPM 7.1.26.
- \_\_\_\_\_ 5.2.2 Ensure regulator PR9190M is installed.
- \_\_\_\_\_ 5.2.3 Closed and block valve H4202A.
- \_\_\_\_\_ 5.2.4 Ensure closed valves H410M\_\_\_\_\_ H409M\_\_\_\_\_ H414M\_\_\_\_\_ H430M\_\_\_\_\_ and H812M\_\_\_\_\_.
- \_\_\_\_\_ 5.2.5 Back off regulator PR9190M.
- \_\_\_\_\_ 5.2.6 Open expander vane valve H464A.
- \_\_\_\_\_ 5.2.7 Open valves H431M\_\_\_\_\_ and H412M\_\_\_\_\_.

- \_\_\_\_\_ 5.2.8 Crack open valve H697M. This valve will be throttled during the purge operation for adequate flow.
- \_\_\_\_\_ 5.2.9 Open valves H9190M\_\_\_\_\_ and H414M\_\_\_\_\_.
- \_\_\_\_\_ 5.2.10 Adjust regulator PR9190M to 40-psi as read on outlet pressure gauge PI9212H.
- \_\_\_\_\_ 5.2.11 Purge expander for a minimum of 15 minutes.
- \_\_\_\_\_ 5.2.12 Close valves H697M\_\_\_\_\_ H412M\_\_\_\_\_ and H414M.
- \_\_\_\_\_ 5.2.13 Close valves H9190M\_\_\_\_\_ and H431M\_\_\_\_\_.
- \_\_\_\_\_ 5.2.14 Set vane valve H464A to 25% open.

### 5.3 Expanders 5A, 6A and Heat exchanger HX7A

- \_\_\_\_\_ 5.3.1 Ensure brake assemblies are installed per C-A OPM 7.1.26.
- \_\_\_\_\_ 5.3.2 Ensure regulator PR9182M is installed.
- \_\_\_\_\_ 5.3.3 Ensure valve H385A is closed and physically blocked from opening.
- \_\_\_\_\_ 5.3.4 Ensure the following valves are closed:

#### Process:

H399M\_\_\_\_\_

H409M\_\_\_\_\_

H410M\_\_\_\_\_

#### Valves to Atmosphere, Relief Valve Header or Pure Helium:

H430M_____	H395M_____
H414M_____	H9190M_____
H418M_____	H700M_____
H793M_____	H812M_____
H9184M_____	H795M_____

- \_\_\_\_\_ 5.3.5 To avoid spinning the turbines, ensure pressure in HX7A is approximately equal to expander pressure (within 0.5 atm).

- \_\_\_\_\_ 5.3.6 Open process valves H397M\_\_\_\_\_ and H402A\_\_\_\_\_ (air line must be jumpered at valve).
- \_\_\_\_\_ 5.3.7 Back off regulator PR9182M.
- \_\_\_\_\_ 5.3.8 Open the following valves:
- |             |                    |
|-------------|--------------------|
| H412M_____  | H431M_____         |
| H9182M_____ | H390A_____ (Vanes) |
| H393M_____  | H464A_____ (Vanes) |
- \_\_\_\_\_ 5.3.9 Crack open valve H695M. This valve will be throttled during the purge operation for adequate flow.
- \_\_\_\_\_ 5.3.10 Adjust regulator PR9182M to 40 psig as read on outlet pressure gauge PI9215H.
- \_\_\_\_\_ 5.3.11 Purge expander train at an audible level for a minimum of 30 minutes.
- \_\_\_\_\_ 5.3.12 Stop the purge by closing the following valves:
- |             |            |
|-------------|------------|
| H695M_____  | H393M_____ |
| H412M_____  | H431M_____ |
| H9182M_____ |            |
- \_\_\_\_\_ 5.3.13 Back off regulator PR9182M.
- \_\_\_\_\_ 5.3.14 Close vane valve H390A\_\_\_\_\_ and set H464A to 25%\_\_\_\_\_.
- \_\_\_\_\_ 5.3.15 Close process valves H397M\_\_\_\_\_ and H402A (restore air lines to normal).
- \_\_\_\_\_ 5.3.16 Remove physical blocking device from valve H385A.
- 5.4 Expander 5B Only
- \_\_\_\_\_ 5.4.1 Install brake assembly per C-A OPM 7.1.26.
- \_\_\_\_\_ 5.4.2 Ensure regulator PR9178M is installed.
- \_\_\_\_\_ 5.4.3 Close and block valve H785A.
- \_\_\_\_\_ 5.4.4 Ensure closed valves H797M\_\_\_\_\_ H793M\_\_\_\_\_ and H430M\_\_\_\_\_.

- \_\_\_\_\_ 5.4.5 Back off regulator PR9178M.
- \_\_\_\_\_ 5.4.6 Open expander vane valve H790A.
- \_\_\_\_\_ 5.4.7 Open valve H431M\_\_\_\_\_ and H795M\_\_\_\_\_.
- \_\_\_\_\_ 5.4.8 Crack open valve H695M. This valve will be throttled during the purge operation for adequate flow.
- \_\_\_\_\_ 5.4.9 Open valves H9180M\_\_\_\_\_ and H793M\_\_\_\_\_.
- \_\_\_\_\_ 5.4.10 Adjust regulator PR9178M to 40-psi as read on outlet pressure gauge PI214H.
- \_\_\_\_\_ 5.4.11 Purge expander for a minimum of 15 minutes.
- \_\_\_\_\_ 5.4.12 Close valves H695M\_\_\_\_\_ H795M\_\_\_\_\_ H793M\_\_\_\_\_.
- \_\_\_\_\_ 5.4.13 Close valves H9178M\_\_\_\_\_ and H431M\_\_\_\_\_.
- \_\_\_\_\_ 5.4.14 Close vane valve H790A.
- 5.5 Expander 6B Only
- \_\_\_\_\_ 5.5.1 Install brake assembly per C-A OPM 7.1.26.
- \_\_\_\_\_ 5.5.2 Ensure regulator PR9186M is installed.
- \_\_\_\_\_ 5.5.3 Close and block valve H802A.
- \_\_\_\_\_ 5.5.4 Ensure closed valves H810M\_\_\_\_\_ H809M\_\_\_\_\_ H814M\_\_\_\_\_ H430M\_\_\_\_\_ and H812M\_\_\_\_\_.
- \_\_\_\_\_ 5.5.5 Back off regulator PR9186M.
- \_\_\_\_\_ 5.5.6 Open expander vane valve H864A.
- \_\_\_\_\_ 5.5.7 Open valves H431M\_\_\_\_\_ and H700M\_\_\_\_\_.
- \_\_\_\_\_ 5.5.8 Crack open valve H697M. This valve will be throttled during the purge operation for adequate flow.
- \_\_\_\_\_ 5.5.9 Open valves H9186M\_\_\_\_\_ and H814M\_\_\_\_\_.

\_\_\_\_\_ 5.5.10 Adjust regulator PR9186M to 40-psi as read on outlet pressure gauge PI9210H.

\_\_\_\_\_ 5.5.11 Purge expander for a minimum of 15 minutes.

\_\_\_\_\_ 5.5.12 Close valves H697M\_\_\_\_\_ H700M\_\_\_\_\_ and H814M\_\_\_\_\_.

\_\_\_\_\_ 5.5.13 Close valves H9186M\_\_\_\_\_ and H431M\_\_\_\_\_.

\_\_\_\_\_ 5.5.14 Set vane valve H864A to 25% open.

5.6 Expanders 5B, 6B and Heat Exchanger HX7B

\_\_\_\_\_ 5.6.1 Ensure brake assemblies are installed per C-A OPM 7.1.26.

\_\_\_\_\_ 5.6.2 Ensure regulator PR9178M is installed.

\_\_\_\_\_ 5.6.3 Ensure valve H785A is closed and physically blocked from opening.

\_\_\_\_\_ 5.6.4 Ensure the following valves are closed:

Process:

H799M\_\_\_\_\_

H809M\_\_\_\_\_

H810M\_\_\_\_\_

Valves to Atmosphere, Relief Valve Header or Pure Helium.

H430M\_\_\_\_\_

H414M\_\_\_\_\_

H418M\_\_\_\_\_

H393M\_\_\_\_\_

H9180M\_\_\_\_\_

H795M\_\_\_\_\_

H9186\_\_\_\_\_

H412M\_\_\_\_\_

H812M\_\_\_\_\_

H395M\_\_\_\_\_

\_\_\_\_\_ 5.6.5 To avoid spinning the turbines, ensure pressure in HX7B is approximately equal to expander pressure (within 0.5 atm).

\_\_\_\_\_ 5.6.7 Back off regulator PR9178M.

\_\_\_\_\_ 5.6.8 Open the following valves:

H700M\_\_\_\_\_

H9178M\_\_\_\_\_

H793M\_\_\_\_\_

H431M\_\_\_\_\_

H790A\_\_\_\_\_ (Vanes)

H864A\_\_\_\_\_ (Vanes)

- \_\_\_\_\_ 5.6.9 Crack open valve H695M. This valve will be throttled during the purge operation for adequate flow.
- \_\_\_\_\_ 5.6.10 Adjust regulator PR9182M to 40 psi as read on outlet pressure gauge PI9214H.
- \_\_\_\_\_ 5.6.11 Purge expander train at an audible level for a minimum of 30 minutes.
- \_\_\_\_\_ 5.6.12 Stop the purge by closing the following valves:
- |             |            |
|-------------|------------|
| H695M_____  | H793M_____ |
| H700M_____  | H431M_____ |
| H9178M_____ |            |
- \_\_\_\_\_ 5.6.13 Back off regulator PR9178M.
- \_\_\_\_\_ 5.6.14 Close vane valve H790A\_\_\_\_\_ and set H864A to 25%\_\_\_\_\_.
- \_\_\_\_\_ 5.6.15 Close process valves H797M\_\_\_\_\_ and H802A\_\_\_\_\_ (restore air line to normal).
- \_\_\_\_\_ 5.6.16 Remove physical blocking device from valve H785A.

## 6. **Documentation**

- 6.1 The check off lines on the procedure are for place keeping only. The procedure is not to be initialed or signed, it is not a record.
- 6.2 The Shift Supervisor shall document the completion of the procedure in the Cryogenics Control Room Log.

## 7. **References**

- 7.1 C-A OPM 7.1.26, Expander Brake System Installation and Removal
- 7.2 Drawing 3A995009, 25KW Helium refrigerator P&ID

## 8. **Attachments**

None